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IMPROVING THE AUTOMATIZATION OF ELECTRIC POWER STATIONS AND NETWORKS

A considerable amount of work on the automatization of industrial processes in electric power stations was done in 1949. The steam output of boiler units with automatically regulated combustion was increased by 20% to 35% of the total installed steam output; the number of automatically controlled hydroelectric units was increased by 32% to 37% and of those with telecontrol by 8.7% to 17% of the total installed capacity of the hydroelectric stations of the Ministry of Electric Power Stations.

However, the 1949 plan for the automatization of industrial processes was in many cases underfulfilled. There was a considerable lag in the automatization of hydroelectric stations and the completion of the plan for automatic combustion; the complex automatization of the Middle Ural GRES was not finished.

In 1950, the ministry established a plan on a larger scale than that of 1949 for the automatization of industrial processes in electric power stations and networks; more than 100 boiler units are to be fitted with automatically regulated combustion; several scores of hydroelectric units are to be fitted with automatic controls, and complex automatization of the boiler plants in a number of electric power stations is to be carried out.

In 1949 the installation of automatic feed regulators was continued, the preparation of pulverized coal and other processes in electric power stations were automatized, and automatic repeated reclosing and quick-acting high-current breakers were extensively incorporated into electric networks. Similar projects are envisaged for 1950. For example, by the end of 1950 about 80% of the total length of lines 35 kv or higher will have been equipped with automatic repeated reclosing. Work on the telemechanization of dispatcher controls, the automatization and telemechanization of electric power stations, and the automatic regulation and control of installations for the generation of electricity at central heating plants is also planned for 1950.

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The state plan visualizes automatization on such a scale that the increase in power of the automatized units will considerably outstrip the installation of new units in electric power stations. Both newly installed units and those already in operation are to be automatized. Increased use is being made of high-pressure units and new, more efficient equipment. Automatic controls and regulators play an important part in the introduction of highly productive technological and industrial processes. Automatization and telemechanization lead to an increase in the operating efficiency of equipment, a further reduction in fuel consumption, and a decrease in the number of operating personnel required in electric power stations and networks.

The Ministry of Electric Power Stations has been given the task of automatization and telemechanization, of standardizing the fitting of various types of automatic devices, of carrying out scientific research and experimental work, and also of producing automatic apparatus and instruments in the ministry's plants. A number of other ministries (Heavy Machine Building, Electrical Industry, Machine and Instrument Building, Communications Equipment) have also been instructed to produce new products such as apparatus and instruments for automatic devices, to meet the needs of automatization and telemechanization. These ministries are charged with the production of power equipment complete with automatic devices. The Ministry of Electric Power Station's Order No 64 of 14 February 1950 entitled, "Measures to be Taken for the Further Automatization and Telemechanization of Electric Power Stations and Networks," gives comprehensive instructions to power systems and enterprises about the work to be done in this field.

So far, however, there have been serious deficiencies and delays in the automatization of thermal processes. In some power stations where automatic devices have been installed, these do not, in fact, work, or are little used and therefore do not have the proper technical-economical effects. Thus, the problem of maintaining the uninterrupted and effective operation of automatic devices already installed is no less important than the further installation of new units in accordance with the established plan.

Considerable resources and effort are being expended on the introduction of automatic devices. The national economy should receive tangible results in the form of increased reliability and economy of operation and a reduction in the number of personnel required. How can this be achieved when, together with an increase in the number of boilers fitted with automatic feed regulators, figures for the first quarter of the current year show an increase in the number of boiler feed breakdowns compared with the preceding quarters? Evidently, insufficient effort is being made at the stations to take advantage of the opportunity afforded by the automatic regulation of boiler units to increase their operating efficiency above the standard of those with hand-regulated feeds.

The task of the further installation of automatic devices and their full utilization cannot be fulfilled by one or two organizations or technical enterprises. The mobilization of the resources of a number of organizations and, above all, of the workers in the power stations and regional administrations is essential. The work of automatization is so great that the resources of the organizations carrying out the design, installation, and testing devices are insufficient. It is quite evident that without considerably initiative on the spot, the program cannot be completed successfully and in good time.

Electric power stations and regional administrations cannot and should not stand by while work which they can do themselves is completed by specialized organizations. At all stages -- design, installation, and testing -- power station workers must be active participators.

Such cooperation will undoubtedly help to train specialists at the power stations who are really familiar with automatic devices. This is borne out by the fact that at many electric power stations where personnel are trained and have experience in operating automatic devices, the most complex combustion and other regulators are installed without the help of specialized organizations. For example, the Orsk TETs not only supervised the installation of the automatic combustion regulator in their last boiler, but also continuously maintained the automatic devices on all their boilers with a utilization factor of 0.99 and higher.

Contrast this with the Middle Ural GRES in which there are a considerable number of automatic devices, most of which do not work. The personnel of this electric power station are not taking sufficiently strong measures to get these devices into operation.

Improvement is required in the work of the OKB (Office of Experimental Construction), the KIP (Testing and Measuring Instruments Trust), and Glavpromenergomontazh (Main Administration of the Industrial Power Installation Trust), which are principally responsible for the design, installation, and testing of thermal automatic devices. Delays can no longer be accepted, for the state plans must be fulfilled. The management of Glavpromenergomontazh (Mizrukhin and Grigor'yev) has not attacked the root causes of breakdown in the design, installation, and testing of automatic devices. The situation in the Teploelektroproyekt (State Institute for Steam Electric Power Station Planning) and its departments must be improved both in the branches concerned with the design of the automatic devices themselves, and in those concerned with the design of main and auxiliary power station machinery directly connected with these devices. Cases have occurred during construction and enlargement of electric power stations where the coal pulverization plant, main supply lines, and gas and air mains require reconstruction to meet the requirements of automatic control.

As the central organization, ORGRES (State Trust for the Organization of Regional Electric Power Stations and Networks) should centralize the study and evaluation of operating experience on thermal automatic devices, and offer recommendations to the electric power stations accordingly. It is particularly important that ORGRES conduct training in the assembly and maintenance of automatic devices on the spot, as there are serious deficiencies in this respect at present. Until this is done, ORGRES will not be fulfilling its proper function in the automatization of thermal processes at electric power stations. It should be noted that at one electric power station, very important work on the development of economy in automatic combustion regulators, which was due for completion by the end of 1949 is still outstanding. Mosenergo is similarly backward.

The VTI (All-Union Thermotechnical Institute) confines its activities in the field of automatic devices to a few Moscow electric power stations. It still has not promulgated the results of its laboratory work on automatic regulation, although these could be quickly utilized by a large number of other stations. Stations are badly in need of such results both in regard to electronic automatic devices and to automatic regulation systems.

The "Energodetal" plant, which makes thermal automatic devices and remote control and telesignaling equipment, is the object of many complaints. Although the quality of production in this plant has been improved, it still has a long way to go. The plant must produce completely sound and reliable instruments; this applies particularly to the new electronic regulators. It must also supply electric power stations with spare parts, particularly those using the plant's earlier products. Stations and power systems must be supplied with automatic control devices in sufficient quantity and time to ensure fulfillment of the state automatization plans.

The ministry's plants must also supply power systems with new materials in the necessary quantities, e.g.: "Energodetal'" plant -- triple-pulse high-pressure feed regulators, remote control and telesignaling equipment; "Elektropul't" plant -- switchboards for boiler and turbine units, dispatcher switchboards and panels, long- and short-distance telemetering apparatus; "Energopribor" plant -- self-recording salinometers for boiler water, all types of small time relays; Kiev plant of the "Armset'" Trust -- apparatus for compounding generators with electromagnetic correctors.

The necessity for very strict economy in resources, materials in short supply, and apparatus must be borne in mind when carrying out automatization and telemechanization. It must be remembered that schemes for the introduction and operation of new power systems require large quantities of material also necessary for the automatic devices themselves, such as control cable. It is most important to strike a proper balance, and all unnecessary complications must be excluded.

The automatization of hydroelectric power stations is a good example of this. Accumulated experience indicated that it was possible to simplify the automatic controls by excluding unnecessary interlocks, surplus elements, and control circuits. This reduction in the required amount of apparatus and cable led to a corresponding increase in the operating efficiency of the automatic devices.

The above example should not only be followed in the automatization of hydroelectric power stations but in all work on automatization and telemechanization. This applies particularly to the complex automatization of boiler units, the automatization and telemechanization of substations, dispatcher control telemechanization in power stations, and the automatization of steam-electric power networks.

In 1949 and the preceding years, automatization of electric power stations already in operation proceeded satisfactorily. However, the introduction of automatic devices into new stations lagged behind. Boilers were fitted without automatic regulators provided in the plans; hydroelectric generators were fitted without automatic controls and transmission lines, and without automatic repeated reclosing. It was sometimes necessary to complete their automatization after they had begun operating, using maintenance personnel for the purpose.

This is an intolerable situation at a time when new construction projects carrying equipment fitted with automatic devices demand an ever-increasing share in the plans. The construction and installation organizations must therefore realize their responsibilities in regard to fulfillment of the automatization plans and deliver boilers, hydroelectric generators, transmission lines, etc., completely equipped with automatic devices and protective apparatus. In this respect, the cognizant stations and the main operating administrations must be more exacting in their demands on the construction and installation organizations.

The automatization and telemechanization of electric power stations and networks can only be successfully completed if all workers and organizations make their full contribution and give their complete cooperation.

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